

S  
333.955  
E30aifs  
2002



**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED  
STATION ON ROSEBUD CREEK,  
ROSEBUD COUNTY, MONTANA**

July 25, 2001

**A report to  
the Montana Department of Environmental Quality  
Helena, Montana**

**by  
Wease Bollman  
Rhithron Associates, Inc.  
Missoula, Montana  
May 2002**

## INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Rosebud Creek at Rosebud, Montana on July 25, 2001. The sample site was located by GPS reading at 46° 16' 09" N, 106° 28' 40" W, lying within the Northwestern Great Plains Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the method recommended by Bukantis (1998) for streams of Montana's Plains ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity. Results from the application of other metric batteries may be found in the Appendix.

## RESULTS AND DISCUSSION

Table 1 itemizes the evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored marginally at this site on Rosebud Creek. Severe sediment deposition was observed, and benthic substrates were perceived to be monotonous. Streambanks were very unstable. Banks lacked vegetative protection, and riparian zone width was abbreviated. Flow conditions were judged marginal, and field observations credit recent rains with the flow that existed at the time of sampling, noting that the "stream was probably dry a few weeks ago."

**Table 1.** Stream and riparian habitat assessment for a fixed station on Rosebud Creek, July, 2001.

Max. possible score	Parameter	Rosebud Creek at Rosebud
10	Riffle development	7
10	Benthic substrate	5
20	Embeddedness	13
20	Channel alteration	14
20	Sediment deposition	5
20	Channel flow status	7
20	Bank stability: left / right	1 / 4
20	Bank vegetation: left / right	2 / 6
20	Vegetated zone: left / right	2 / 6
160	Total	71
	Percent of maximum CONDITION*	<b>44</b> <b>MARGINAL</b>

\*Condition categories: Optimal (OPT) > 80% of maximum score; Sub-optimal (SUB); 75 - 56%; Marginal (MARG) 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

**Table 2.** Metric values, scores, and bioassessment for a fixed station on Rosebud Creek. The Montana DEQ bioassessment metric battery recommended for streams of the Plains ecoregions (Bukantis 1998) was used for the evaluation. July 2001.

	Rosebud Creek at Rosebud	
METRICS	METRIC VALUES	METRIC SCORES
Taxa richness	26	3
EPT richness	10	3
Biotic index	5.65	2
% Dominant taxon	18.45	3
% Collectors	63.59	2
% EPT	43.20	2
Shannon diversity	3.48	3
% Scrapers and Shredders	8.74	1
Predator taxa	7	3
% Multivoltine	38.11	3
	<b>TOTAL SCORE</b> (max.=30)	25
	<b>PERCENT OF</b> <b>MAX.</b>	83
	<b>Impairment</b> <b>classification</b>	<b>NON-IMPAIRED</b>
	<b>USE SUPPORT</b>	<b>FULL</b>

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on Rosebud Creek is non-impaired and fully supports designated uses. The abundance of animals in the sample was lower than necessary for reliable calculation of metrics and interpretation of results, however. It is not clear from the data whether the dearth of benthos was due to a depauperate community or to sampling bias.

Water quality indicators give equivocal signals in this data; the biotic index value (5.65) was somewhat higher than expected limits but the mayfly taxa richness (5) was within expectations. Warm water is evident from the measured temperature at the time of sampling (25.3°C), and the major components of the mayfly fauna are taxa tolerant of nutrient enrichment. These taxa are *Caenis latipennis*, *Choroterpes* sp., and *Tricorythodes mimtus*. Thus, both factors appear to exert influence over the benthic assemblage. Anoxic sediments are likely present at the site, since hemoglobin-bearing chironomids were common in the sample.

Ten percent of the animals collected were the hydroptilid caddisflies *Hydroptila* sp. and *Ithytrichia* sp.; their abundance suggests that filamentous algae may have been a prominent feature of the instream landscape. Macrophytes may have added complexity to habitats, since the mayfly *Caenis latipennis* was accommodated. Ten “clinger” taxa were present, and “clingers” comprised more than 50% of animals in the sample, suggesting that some hard substrate unaffected by fine sediment deposition was available for colonization, despite the observed heavy deposition noted in the habitat assessment. The sampled assemblage was taxonomically diverse in spite of the small sample size, and

predators were a major component of the fauna; 41 individuals in 7 taxa were collected. These findings suggest that instream habitats were varied, available, and abundant.

All expected functional components of a Plains stream benthic community were present in the sample, though the proportion of scrapers was lower than expected. Turbidity may account for the dearth of this group.

## **CONCLUSIONS**

- The taxonomic composition of the assemblage and its overall tolerance suggests warm water and nutrient enrichment.
- The site supported a diverse assemblage, which may have been sparsely distributed, suggesting that, for the most part, habitats were not severely impaired.
- The bioassessment method used here seems to overestimate the quality of the benthic community to some degree. Evidence of slight impairment can be discerned in the taxonomic and tolerance characteristics of the assemblage.

## **LITERATURE CITED**

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft. April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs) Reston, Virginia. US Geological Survey.

**APPENDIX**

**Taxonomic data and summaries**

**Rosebud Creek**

**July 2001**

Aquatic Invertebrate Taxonomic Data

Site Name: Rosebud Creek at Rosebud

Date: 7/25/01

Site ID: Y17ROSEC01

Approx. percent of sample used 100

Taxon	Quantity	Percent	HBI	FFG
Nematoda	1	0.49	11	PA
Tubificidae - immature	3	1.46	10	CG
Physidae	4	1.94	8	SC
<b>Total Misc. Taxa</b>	<b>8</b>	<b>3.88</b>		
<i>Acentrella turbida</i>	1	0.49	4	CG
<i>Fallceon quilleri</i>	2	0.97	5	CG
<i>Caenis latipennis</i>	22	10.68	7	CG
<i>Choroterpes</i> sp.	5	2.43	2	CG
<i>Tricorythodes minutus</i>	1	0.49	4	CG
<b>Total Ephemeroptera</b>	<b>31</b>	<b>15.05</b>		
<i>Trichocorixa borealis</i>	4	1.94	10	PR
<i>Ambrysus mormon</i>	14	6.80	3	PR
<b>Total Hemiptera</b>	<b>18</b>	<b>8.74</b>		
<i>Sialis</i> sp.	9	4.37	4	PR
<b>Total Megaloptera</b>	<b>9</b>	<b>4.37</b>		
<i>Cheumatopsyche</i> sp.	26	12.62	5	CF
<i>Hydropsyche</i> sp.	9	4.37	5	CF
<i>Hydropnla</i> sp.	15	7.28	6	PH
<i>Ithytrichia</i> sp.	7	3.40	4	SC
<i>Polycentropus</i> sp.	1	0.49	6	PR
<b>Total Trichoptera</b>	<b>58</b>	<b>28.16</b>		
<i>Dubiraphia</i> sp.	10	4.85	6	CG
<i>Microcylloepus</i> sp.	2	0.97	5	SC
<b>Total Coleoptera</b>	<b>12</b>	<b>5.83</b>		
Ceratopogoninae	3	1.46	6	PR
<i>Hexatoma</i> sp.	1	0.49	2	PR
<b>Total Diptera</b>	<b>4</b>	<b>1.94</b>		
Cricotopus (Cricotopus) Gr.	1	0.49	7	CG
<i>Dicrotendipes</i> sp.	9	4.37	8	CG
<i>Polypedilum</i> sp.	5	2.43	6	SH
<i>Pseudochironomus</i> sp.	4	1.94	5	CG
<i>Tanytarsus</i> sp.	38	18.45	6	CF
Thienemammimyia Gr.	9	4.37	5	PR
<b>Total Chironomidae</b>	<b>66</b>	<b>32.04</b>		
<b>Grand Total</b>	<b>206</b>	<b>100.00</b>		

**Aquatic Invertebrate Summary**

Site Name: Rosebud Creek at Rosebud

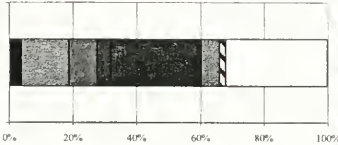
Date: 7/25/01

SAMPLE TOTAL 206

EPT abundance	89
TAXA RICHNESS	26
Number EPT taxa	10
Percent EPT	43.20

**TAXONOMIC COMPOSITION**

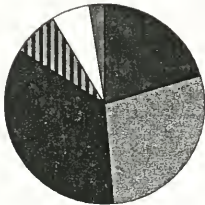
GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	3.88	3	8
Odonata	0.00	0	0
Ephemeroptera	15.05	5	31
Plecoptera	0.00	0	0
Hemiptera	8.74	2	18
Megaloptera	4.37	1	9
Trichoptera	28.16	5	58
Lepidoptera	0.00	0	0
Coleoptera	5.83	2	12
Diptera	1.94	2	4
Chironomidae	32.04	6	66



- Misc. Taxa
- Odonata
- Ephemeroptera
- Plecoptera
- Hemiptera
- Megaloptera
- Trichoptera
- Lepidoptera
- Coleoptera
- Diptera
- Chironomidae

**FUNCTIONAL COMPOSITION**

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	19.90	7	41
Parasite	0.49	1	1
Gatherer	28.16	10	58
Filterer	35.44	3	73
Herbivore	0.00	0	0
Piercer	7.28	1	15
Scraper	6.31	3	13
Shredder	2.43	1	5
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.00	0	0



- Predator
- Parasite
- Gatherer
- Filterer
- Herbivore
- Piercer
- Scraper
- Shredder
- Xylophage
- Omnivore
- Unknown

**COMMUNITY TOLERANCES**

Sediment tolerant taxa	4
Percent sediment tolerant	4.37
Sediment sensitive taxa	0
Percent sediment sensitive	0.00
Metals tolerance index (McGuire)	3.70
Cold stenotherm taxa	0
Percent cold stenotherms	0.00

**Site ID: Y17ROSEC01**

**DOMINANCE**

TAXON	ABUNDANCE	PERCENT
<i>Tanytarsus</i> sp	38	18.45
<i>Cheumatopsyche</i> sp	26	12.62
<i>Caenis latipennis</i>	22	10.68
<i>Hydroptila</i> sp	15	7.28
<i>Ambrysus mormon</i>	14	6.80
SUBTOTAL 5 DOMINANTS	115	55.83
<i>Dabryia</i> sp	10	4.85
<i>Salix</i> sp	9	4.37
<i>Hydropteryx</i> sp	9	4.37
<i>Dicranodipeis</i> sp	9	4.37
<i>Thienemannia</i> Gr	9	4.37
TOTAL DOMINANTS	161	78.16

**SAPROBITY**

Hilsenhoff Biotic Index	5.65
-------------------------	------

**DIVERSITY**

Shannon H (loge)	2.41
Shannon H (log2)	3.48

Simpson D

Simpson D	0.09
-----------	------

**VOLITINISM**

TYPE	ABUNDANCE	PERCENT
Multivoltine	79	38.11
Univoltine	116	56.07
Semivoltine	12	5.83

**TAXA CHARACTERS**

Tolerant	#TAXA	ABUNDANCE	PERCENT
Tolerant	10	101	49.03
Intolerant	0	0	0.00
Clinger	10	114	55.34

**BIOASSESSMENT INDICES**

B-IBI (Karr et al )

METRIC	VALUE	SCORE
Taxa richness	26	3
E richness	5	3
P richness	0	1
T richness	5	3
Long-lived	2	1
Sensitive richness	0	1
%tolerant	49.03	3
%predators	19.90	3
Clinger richness	10	1
%dominance (3)	41.75	5
<b>TOTAL SCORE</b>		<b>24</b>

48 %

**MONITANA DEQ METRICS (Bukantus 1998)**

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	26	3	2	2
EPT richness	10	3	0	0
Biotic Index	5.65	2	1	0
%Dominant taxon	18.45	3	3	3
%Collectors	63.59	2	2	2
%EPT	43.20	2	1	1
Shannon Diversity	3.48	3		
%Scrapers + Shredd	8.74	1	0	0
Predator taxa	7	3		
%Multivoltine	38.11	3		
%alt of T	60.3		3	
<b>TOTAL SCORES</b>		<b>25</b>	<b>12</b>	<b>8</b>
		<b>83.33</b>	<b>50.00</b>	<b>38.10</b>
<b>IMPAIRMENT CLASS</b>		<b>NON</b>	<b>MODERATE</b>	<b>MODERATE</b>

**Montana DEQ metric batteries**

